MULTIMEDIA UNIVERSITY

STUDENT ID NO | | | | | | | | | | |

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015/2016

DCS5028 – DISCRETE STRUCTURES

(All sections / Groups)

7 MARCH 2016
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **FIVE (5) pages** (excluding the cover page). There are **TWO (2)** sections in this question paper. Please attempt **ALL** questions in the **TWO (2)** sections.

   Section A: Multiple Choice Questions, Question 1-15 (30 marks)
   Section B: 3 Structured Questions (70 marks)

2. For **Section A**, please shade your answers on the **OMR sheet** provided.

3. For **Section B**, please write your answers in the **Answer Booklet** provided.

SECTION A: MULTIPLE CHOICE QUESTIONS (each question 2 marks)

Answers for this section should be shaded on the OMR form.

1. With 31 flavors of ice cream, 4 sizes of serving, and a choice of "cone" or "dish," how many different orders of ice cream are there?
   A. 248
   B. 37
   C. 62
   D. 250

2. In how many ways 4 boys and 3 girls can be seated in a row so that they are alternate?
   A. 144
   B. 288
   C. 12
   D. 256

3. In a Midterm Test for Discrete Structure, a student must select 15 out of 20 questions. In how many ways can this be done?
   A. 150
   B. 1550
   C. 15504
   D. 300

4. How many strings can be formed by ordering the letters INDEPENDENT using all of the letters?
   A. 50040
   B. 27720
   C. 39916800
   D. 554400

5. IT and Social Club has 25 members, how many ways can be done to select a leader and an assistant leader?
   A. 25
   B. 600
   C. 625
   D. 30

6. Given $K = \{x \mid 0 < x < 5\}$ and $L = \{1, 2, 4, 8, 64\}$ where f is the function from K to L. Let $f(x) = 2x$. The function is :

   A. Injective
   B. A general function
   C. Surjective
   D. Bijective

7. A binary relation on a set is said to be *partial order* if it contains :

   I. Reflexive
   II. Symmetric
   III. Antisymmetric
   IV. Transitive

   A. I,II and IV
   B. I,III and IV
   C. II,III and IV
   D. I, II and III

Continued.....

Questions 8 - 10 are based on:
Let the universe be the set U = {a,b,c,d,…,x,y,z}. Let A = {c,d,o,u,} B = {a,b,e,f,h,i,j,k,o,u,p,z }, and C = {b,c,e,h,k,m,n,p,r,s,v,w}.

8. What is the power set of set A?

A. 4
B. 8
C. 12
D. 16

9. What is the cardinality of $(B - (C \cup A)$?

A. 4
B. 6
C. 5
D. 7

10. What is the element of $(A \cap (B \cap U)$?

A. {o, u}
B. {a,b,e,f,h,i,j,k,p,z }
C. {c,d,}
D. { a,b,c,d,e,f,h,i,j,k,o,u,p,z}

11. Given a c program code segment:

```
for ( num = 0; num < x; ++num)
{
  Sum + = num;
}
```

What is the final value of *Sum* when x = 5?

A. 5
B. 10
C. 15
D. 20

12. Which of the following special symbols allowed in a variable name?

A. * (asterisk)
B. - (hyphen)
C. _ (underscore)
D. | (pipeline)

13. Which of the following cannot be checked in a *switch-case* statement?

A. Character
B. Float
C. Integer
D. Enum

Continued.....

14. What is the ***Greatest Common Divisor*** (GCD) of 27 and 4?

A. 0
B. 1
C. 3
D. 6

15. Using *GCD* (27, 4), find the value of s and t such that $27s + 4t = gcd\,(27, 4)$.

A. $s = 7, t = -1$
B. $s = -1, t = 7$
C. $s = 6, t = 1$
D. $s = 1, t = 6$

SECTION B: STRUCTURED QUESTIONS (TOTAL: 70 Marks)
Answer all questions and show necessary workings in the answer booklet provided.

QUESTION 1 (25 Marks)

A. Use a mathematical induction to prove that

$$1 + 4 + 7 + \cdots + (3n - 2) = \frac{n(3n - 1)}{2}$$

is true for all positive integers number. [10M]

B. Use a truth table to prove that $(p \vee (q \wedge r))$ is equivalent to $(p \vee q) \wedge (p \vee r)$ [8M]

C. Formulate the arguments below symbolically and determine whether each argument is valid.

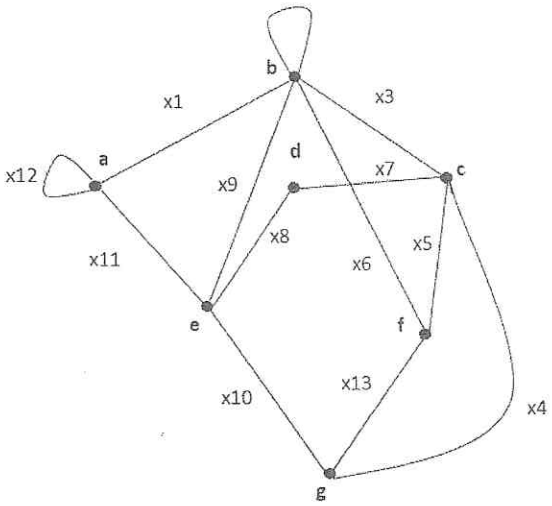
If there is smoke in here, then there is fire in here. There is no fire in here. Therefore there is no smoke.

[7M]

Continued.....

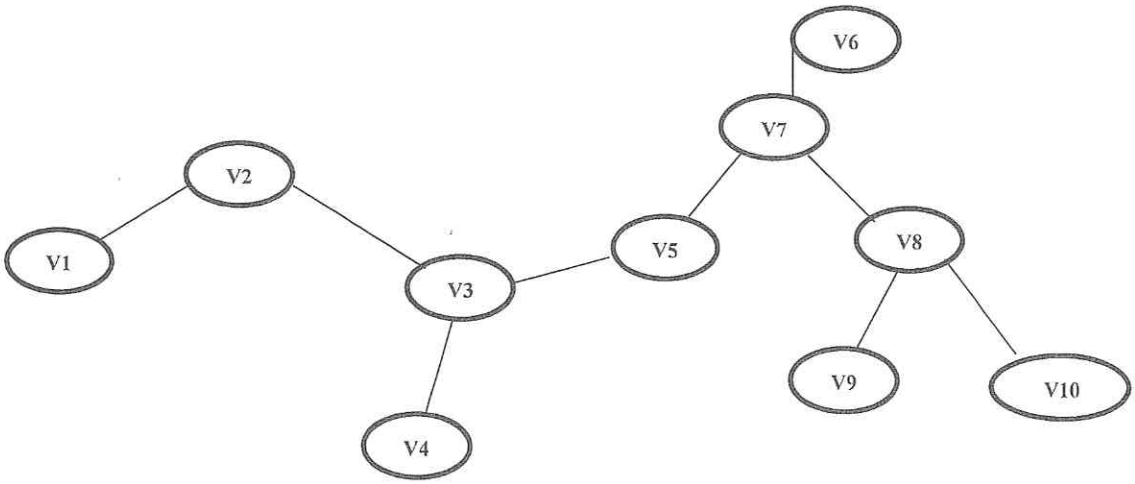
QUESTION 2 (25 marks)

A. Write the ***adjacency matrix*** and the ***incidence matrix*** for the Graph M. [6M]



Graph M

B. A tree is given as follows.



a) Redraw the following tree with "V7" as the root. [4M]

Continued.....

b) By referring to the tree drawn at a), answer the following questions:-
   i) List all level-2 vertices [1M]
   ii) List all internal vertices [1M]

C. A list of numbers are in the following sequence:

50, 76, 21, 4, 32, 64, 15, 52, 14, 100

a) Create a *binary tree*. [4M]
b) List the order in which the vertices are processed using *preorder*, *inorder* and *postorder traversal*. [9M]

QUESTION 3 (20 marks)

A. Given the transition diagram of the finite state automaton (I , S, f, A, σ)

a) Draw the transition diagram of the finite state automaton [10M]

$I = \{a,b,c\}$, $S = \{S_0, S_1, S_2, S_3\}$, $A = \{S_2, S_1\}$

State \ I	F		
	A	B	C
S_0	S_3	S_1	S_0
S_1	S_1	S_0	S_2
S_2	S_2	S_1	S_3
S_3	S_1	S_0	S_1

b) Determine whether the given string is accepted by the following finite state automaton:

   i) cbacacbb [1M]
   ii) bccabacc [1M]

B. Draw the Karnaugh map for the optimal Boolean expression

a) $a' \vee cd \vee c'bd' \vee a'd' \vee cd'b \vee abc'$ [5M]
b) $xyt \vee xy't \vee xyt' \vee x'y' \vee x'yt$ [3M]

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